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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/565,962	06/20/2006	Avraham Frenkel	P8510US	8459

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EXAMINER	
SMITH, CHAD	
ART UNIT	**PAPER NUMBER**
2874	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/565,962	FRENKEL, AVRAHAM	
	Examiner	Art Unit	
	Chad H. Smith	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *19,20,42 and 43* is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. 10565962.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/26/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

Claims 19, 20, 42 and 43 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter: The limitation of "irregularity comprises two elements in the form of two parts of a split cylinder kept at a predetermined distance" as recited in claim 19 is not anticipated in the cited prior art and the closest to a split cylindrical configuration of irregular elements is found in U.S. Patent # 6,853,791 B2 by Sigalas wherein the irregularity is in an elliptical shape.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 – 11, 14 – 18, 21 – 34, and 37 – 41 are rejected under 35 U.S.C. 102(b) as being anticipated by Joannopoulos et al. (U.S. Patent # 6,058,127).

Regarding claim 1, Joannopoulos et al. teaches a photonic band gap micro-resonator device, comprising an array of regular elements (202) in a surrounding matrix arranged in a grid

(fig. 2A), wherein in at least one of a plurality of selected element positions an irregularity is presented in the form of two or more elements replacing a single regular element of the array (col. 3, lines 28 – 29, lines 35 – 60).

Regarding claim 2, Joannopoulos et al. teaches wherein the array is two-dimensional (col. 3, lines 35 – 40, col. 6, line 6).

Regarding claim 3, Joannopoulos et al. teaches wherein the array is three-dimensional (col. 6, line 8).

Regarding claim 4, Joannopoulos et al. teaches wherein the irregularity comprises two elements (col. 3, lines 58 – 60).

Regarding claim 5, Joannopoulos et al. teaches wherein the irregularity comprises four elements (col. 3, line 58 – 60).

Regarding claim 6, Joannopoulos et al. teaches wherein the irregularity is in the form of a diamond (col. 3, lines 39 – 42).

Regarding claim 7, Joannopoulos et al. teaches wherein the irregularity is in the form of a stretched diamond (col. 3, lines 39 – 42).

Regarding claim 8, Joannopoulos et al. teaches wherein the irregularity comprises elements that are smaller in dimension than the regular elements (col. 3, lines 42 – 46).

Regarding claim 9, Joannopoulos et al. teaches wherein the irregularity comprises elements that are made from material other than the material from which the regular elements are made (col. 3, lines 39 – 42).

Regarding claim 10, Joannopoulos et al. teaches wherein the irregularity comprises elements surrounded by a surrounding matrix of different character than the surrounding matrix of the regular elements (Fig. 2B).

Regarding claim 11, Joannopoulos et al. teaches wherein the irregularity comprises elements that are aligned with axes of the array (fig. 2A. col. 3, line 38).

Regarding claim 14, Joannopoulos et al. teaches wherein the irregularity is a characterized as a combination of characteristics selected from the group of characteristics including: elements that are smaller in dimension than the regular elements (col. 3, line 42), elements that are made from material other than the material from which the regular elements are made (col. 3, lines 40 – 42), elements surrounded by a surrounding matrix of different character than the surrounding matrix of the regular elements (fig. 2B), elements that are aligned with the regular elements (fig. 2B), elements that are rotated with respect to the regular elements (fig. 2A) and elements that are of a shape different than the shape of a regular element (col. 3, line 42).

It has been interpreted that the meaning of combination is more than one but at least two items in a group. Therefore only two of the above list of element characteristics needed to be found in the prior art.

Regarding claim 15, Joannopoulos et al. teaches further comprising two channels for traversing electromagnetic radiation within the array, with the irregularity positioned between the channels, producing a channel drop filter (col. 5, lines 46 – 49, col. 6, line 14).

Regarding claim 16, Joannopoulos et al. teaches wherein the channels are optical channels (col. 3, lines 9 – 10).

Regarding claim 17, Joannopoulos et al. teaches wherein the channels are substantially parallel (col. 3, lines 9 – 10, fig. 1 shows substantially parallel).

Regarding claim 18, Joannopoulos et al. teaches wherein a plurality of irregularities is provided in the array in the form of a periodic line of that serves as a dispersive waveguide (col. 6, line 4).

Regarding claim 21, Joannopoulos et al. teaches a method for photonic band gap micro-resonance comprising: providing an array of regular elements (202) regular elements in a surrounding matrix arranged in a grid (fig. 2A), wherein in at least one of a plurality of selected

element positions an irregularity is presented in the form of two or more elements replacing a single regular element of the array (col. 3, lines 28 – 29, lines 35 – 60); irradiating electromagnetic radiation (col. 2, lines 35 – 36) through to the irregularity causing a resonance effect. (col. 1, lines 18 – 22, lines 34 – 42).

Regarding claim 22, Joannopoulos et al. teaches wherein the array is two-dimensional (col. 3, lines 35 – 40, col. 6, line 6).

Regarding claim 23, Joannopoulos et al. teaches wherein the array is three-dimensional (col. 6, line 8).

Regarding claim 24, Joannopoulos et al. teaches wherein the irregularity comprises two elements (col. 3, lines 58 – 60).

Regarding claim 25, Joannopoulos et al. teaches wherein the irregularity comprises four elements (col. 3, line 58 – 60).

Regarding claim 26, Joannopoulos et al. teaches wherein the irregularity is in the form of a diamond (col. 3, lines 39 – 42).

Regarding claim 27, Joannopoulos et al. teaches wherein the irregularity is in the form of a stretched diamond (col. 3, lines 39 – 42).

Regarding claim 28, Joannopoulos et al. teaches wherein the irregularity is resonated as a monopole (col. 1, lines 19 – 25).

Regarding claim 29, Joannopoulos et al. teaches wherein the irregularity is resonated as a dipole (col. 1, lines 19 – 25).

Regarding claim 30, Joannopoulos et al. teaches wherein the irregularity is resonated as a quadra-pole (col. 1, lines 19 – 25).

Regarding claim 31, Joannopoulos et al. teaches wherein the irregularity comprises elements that are smaller in dimension than the regular elements (col. 3, lines 42 – 46).

Regarding claim 32, Joannopoulos et al. teaches wherein the irregularity comprises elements that are made from material other than the material from which the regular elements are made (col. 3, lines 39 – 42).

Regarding claim 33, Joannopoulos et al. teaches wherein the irregularity comprises elements surrounded by a surrounding matrix of different character than the surrounding matrix of the regular elements (Fig. 2B).

Regarding claim 34, Joannopoulos et al. teaches wherein the irregularity comprises elements that are aligned with the regular elements (fig. 2A. col. 3, line 38).

Regarding claim 37, Joannopoulos et al. teaches wherein the irregularity is a characterized as a combination of characteristics selected from the group of characteristics including: elements that are smaller in dimension than the regular elements (col. 3, line 42), elements that are made from material other than the material from which the regular elements are made (col. 3, lines 40 – 42), elements surrounded by a surrounding matrix of different character than the surrounding matrix of the regular elements (fig. 2B), elements that are aligned with the regular elements (fig. 2B), elements that are rotated with respect to the regular elements and elements that are of a shape different than the shape of a regular element (col. 3, line 42).

It has been interpreted that the meaning of combination is more than one but at least two items in a group. Therefore only two of the above list of element characteristics needed to be found in the prior art.

Regarding claim 38, Joannopoulos et al. teaches further comprising two channels for traversing electromagnetic radiation within the array, with the irregularity positioned between the channels, producing a channel drop filter (col. 5, lines 46 – 49, col. 6, line 14).

Regarding claim 39, Joannopoulos et al. teaches wherein the channels are optical channels (col. 3, lines 9 – 10).

Regarding claim 40, Joannopoulos et al. teaches wherein the channels are substantially parallel (col. 3, lines 9 – 10, fig. 1 shows substantially parallel).

Regarding claim 41, Joannopoulos et al. teaches wherein a plurality of irregularities is provided in the array in the form of a periodic line of that serves as a dispersive waveguide (col. 6, line 4).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 12 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joannopoulos et al. (U.S. Patent # 6,058,127) in view of Matsuura et al. (U.S. Patent # 6,961,501 B2).

The cited primary reference teaches the basic claimed photonic band gap micro-resonator as discussed in claims 1 and 21 above.

The cited primary reference does not teach wherein the irregularity comprises elements that are rotated with respect to axes of the array or wherein the irregularity comprises elements that are rotated with respect to the regular elements.

The added secondary reference teaches dielectric pillars rotated relative to the placement of surrounding dielectric pillars so as to change the direction of the electromagnetic field pattern or change the frequency of light passing through the photonic crystal (col. 10, lines 41 – 46, fig. 13).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Joannopoulos et al.'s photonic band gap micro-resonator with Matsuura et al.'s teachings of dielectric pillars rotated relative to the placement of surrounding dielectric pillars so as to change the direction of the electromagnetic field pattern or change the frequency of light passing through the photonic crystal.

Claims 13 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joannopoulos et al. (U.S. Patent # 6,058,127) in view of Sigalas (U.S. Patent # 6,853,791 B2).

Regarding claims 13 and 36, the cited primary reference teaches the basic claimed photonic band gap micro-resonator device as discussed in claims 1 and 21 above respectively.

The cited primary reference does not teach wherein the irregularity comprises elements that are of a shape different than the shape of a regular element.

The added secondary reference teaches elliptical defects which provide much wider waveguide bands than do circular holes (col. 5, lines 34 – 37).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Joannopoulos et al.'s photonic band gap micro-resonator device with Sigalas' teaching of elliptical defects as the elliptical defects provide much wider waveguide bands than do circular holes.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chad H. Smith whose telephone number is (571) 270-1294. The examiner can normally be reached on Monday-Thursday 7:30a.m. - 5:00p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on 571-270-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CHS

SUNG PAK
PRIMARY EXAMINER